

**Minutes - Standing Committee on Fiscal Issues - October 12, 2004**

**REPORTS**

**Minute No. 48      West End Water Pollution Control Centre (WEWPCC) Process  
Upgrading: Biological Nutrient Removal and Disinfection System  
Enhancements  
File WS-7**

**STANDING COMMITTEE DECISION:**

The Standing Committee on Fiscal Issues concurred in the administrative recommendation and received the report as information.

**Minutes - Standing Committee on Fiscal Issues - October 12, 2004**

DECISION MAKING HISTORY:

Moved by Councillor Thomas,

That the administrative recommendation be concurred in.

Carried

**RE: WEST END WATER POLLUTION CONTROL CENTRE (WEWPCC)  
PROCESS UPGRADING: BIOLOGICAL NUTRIENT REMOVAL AND  
DISINFECTION SYSTEM ENHANCEMENTS**

**FOR SUBMISSION TO:** THE STANDING COMMITTEE ON FISCAL ISSUES

**ORIGINAL REPORT SIGNED BY:** Barry D. MacBride, P.Eng.  
Director, Water and Waste Department

**REPORT DATE:** October 5, 2004

**RECOMMENDATION(S):** That this report be received as information.

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**REPORT SUMMARY**

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**KEY ISSUES:**

- Manitoba Conservation issued an Environment Act License for the West End Water Pollution Control Center on September 3, 2004.
- This project is necessary to meet the following requirements of this license.
  - year round effluent disinfection
  - new effluent limits for nitrogen and phosphorous
  - complete the construction and commissioning of the upgraded wastewater plant by December 31, 2006.
- An internal preliminary risk assessment indicated the following risks:
  - The schedule for project completion by December 31, 2006 including plant commissioning cannot be achieved.
  - The license will be appealed to the Minister of Conservation and final project costs may change depending on disposition of the appeal.
  - There is a possibility of project cost escalation due to market forces.
  - Acceptance of septage at this plant may impact the new biological process.
  - A wastewater characterization study completed in late August 2004, indicates a higher than normal soluble non-biodegradable nitrogen component which may require a higher degree of treatment to meet license effluent limits.

**IMPLICATIONS OF THE RECOMMENDATION(S):**

**General Implications**

- |   |   |
|---|---|
| X | None  |
|   | For the organization overall and/or for other departments               |
|   | For the community and/or organizations external to the City of Winnipeg |
|   | Involves a multi-year contract  |

Comment(s):

**Policy Implications**

- No
- Yes - Comment(s):

**Environmental Implications**

- None
- Yes - Comment(s): Part of Lake Winnipeg Nutrient Reduction Strategy. Year-round disinfection rather than just May to September.

**Human Resources Implications**

- No
- Yes - Comment(s): Additional staff will be required to operate and maintain the expanded facility.

**Financial Implications**

- Within approved current and/or capital budget
  - Current and/or capital budget adjustment required
- Comment(s): Additional Capital funding has been identified in the 2005 Capital Program as submitted for Council's consideration.

## **REPORT**

### **REASON FOR THE REPORT:**

At its meeting held on December 16, 1999 City Council adopted a policy whereby all Capital projects with a total estimated cost of \$10 million or more be submitted by the associated Civic Department to the Standing Policy Committee on Fiscal Issues for review and recommendation prior to any bid solicitation being issued.

### **HISTORY:**

- 1992 The Clean Environment Commission (CEC) convened Public Hearings regarding application of the Manitoba Surface Water Quality Objectives for the Red River, Assiniboine River, and tributaries. As a result of the hearings the CEC made recommendations, which are intended to protect the Red and Assiniboine Rivers such that their use is not adversely impacted.
- 1993 Minister of Environment adopted the Clean Environment Commission (CEC) recommendations requiring the City to disinfect effluent from its three wastewater treatment plants during the summer recreational season from May 1<sup>st</sup> to September 30<sup>th</sup>.
- 1993 Funds in the amount of \$520,000 were included in the 1993 approved Supplementary Capital Estimates for Disinfection of Effluent at the WEWPCC.
- 1999 Assignment of consulting engineering services to Reid Crowther & Partners Ltd. for study of nitrification processes at the City's three wastewater treatment facilities.
- 2000 The funds approved in 1993 for disinfection were carried forward and re-approved by Council in the 2000 Supplementary Capital Estimates. This Capital had not been used for disinfection to date as the lagoons at the WEWPCC were already meeting proposed disinfection targets for the defined summer recreation season.
- 2003 In January and April, at the request of the Province of Manitoba, the Manitoba CEC conducted public hearings on the City of Winnipeg's Wastewater Collection and Treatment Systems.
- 2003 On August 26, the CEC issued their report on the hearings recommending that Manitoba Conservation establish "interim" effluent limits for Winnipeg's three Water Pollution Control Centres in accordance with their Water Quality Standards, Objectives and Guidelines, and further that the City of Winnipeg be directed to plan for removal of nutrients, specifically nitrogen and phosphorous from its treated wastewater discharges.

- 2003 The Assistant Deputy Minister of Manitoba Conservation wrote a letter dated September 26, to the Director of the Water and Waste Department, advising of their plans to reflect the CEC report recommendations in Environment Act Licenses for the City's wastewater treatment plants.
- 2003 On November 26, Council concurred in the recommendation of the Executive Policy Committee and adopted an increase to the Sewer Utility's rates to be effective January 1, 2004.
- 2003 On December 3, the City of Winnipeg authorized Earth Tech (Canada) Inc. (formerly Reid Crowther & Partners Ltd.) to undertake a WEWPCC Nutrient Removal Conceptual Design Study.
- 2003 On December 10, February 2 and February 24, 2004 meetings were held between the City and the Province to discuss plans for wastewater system improvements.
- 2003 On December 16, Council adopted the 2004 Capital Budget and the 2005-2009 Five Year Forecast that included \$8,905,000.00 for Nutrient Removal - WEWPCC and \$3,398,000.00 for Wastewater Disinfection - WEWPCC.
- 2004 On June 23, Council received as information a report outlining the work schedule and financing plan for the sewer utility that included implementing biological nutrient removal and effluent disinfection upgrades at the WEWPCC by 2006.
- 2004 On July 4, Manitoba Conservation issued a draft Environment Act License to the City of Winnipeg for the WEWPCC.
- 2004 The City of Winnipeg submitted their comments and proposed changes to the draft License for the WEWPCC to Manitoba Conservation on August 9, 2004.
- 2004 Manitoba Conservation issued the Environment Act License to the West End Water Pollution Control Centre on September 3, 2004.

## **DISCUSSION:**

Pursuant to the administrative policy pertaining to Capital projects with a total estimated cost of \$10 million or greater, the formation of a Major Capital Projects Steering Committee is required. This committee has been formed and its members are as follows.

- Barry D. MacBride - Director and Chair
- Mike Ruta - Corporate Controller
- Bill Larkin - Director, Public Works
- Harry Finnigan - Director, Planning Property and Development

This Committee has reviewed this report and concurs that the report be submitted for consideration to the Standing Policy Committee on Fiscal Issues.

### **Regulatory Requirements**

On September 3, 2004, Manitoba Conservation issued Environment Act License No. 2669 to the City of Winnipeg for the West End Water Pollution Control Center, rescinding the previous Stage 1 License No. 1370. This new license outlines an effluent limit for biochemical oxygen demand, nitrogen and phosphorus which are acceptable to the City but goes on to impose new limits for suspended solids and bacteria that are not acceptable to the City and will be appealed to the Minister of Conservation. This appeal was submitted by the October 1, 2004 deadline. The results of this appeal may not be known for several months.

The items to be appealed, that have a direct impact on the cost of this project are:

#### Year-round effluent disinfection:

The City agrees with the limits of 200 E.coli and fecal coliforms /100ML that have been imposed but these limits should be applied only to the recreational use period of the year between May 1<sup>st</sup> and September 30<sup>th</sup>. The cost to meet this requirement is approximately \$4,000,000.

#### Total suspended solids limit:

Effluent from the WEWPCC mechanical plant will be routed through storage ponds. Suspended solids measured in the effluent from the storage ponds may contain algae which will give misleading results. The City will request that growing algae be excluded from the suspended solids measurement. If this amendment to the license is not granted, the existing storage ponds may need to be abandoned. Abandoning the storage ponds will result in the loss of some natural treatment capacity for wet weather flows and the loss of the natural ultraviolet light disinfection process during the summer months.

### **Engineering**

In December 2003, the City of Winnipeg requested that Earth Tech (Canada) Inc. undertake a conceptual design of a nutrient removal plant at WEWPCC that would meet the nutrient standards for nitrogen and phosphorus proposed by the Province at that time. In March 2004, Earth Tech completed the WEWPCC Nutrient Removal Conceptual Design Study, Draft Report.

In June 2004, the City of Winnipeg requested that Earth Tech (Canada) Inc. prepare a proposal for professional engineering services for the WEWPCC upgrade. On August 4, 2004 Earth Tech (Canada) submitted the Proposal for Professional Engineering Services for the West End Water Pollution Control Centre Biological Nutrient Removal and UV Disinfection Upgrade. This proposal is based on the following conceptual design:

- Installation of a ferric dosing system for the control of odor and filamentous bacteria.

- Construction of a third bioreactor to increase the total bioreactor volume which is required for nitrification.
- Retrofitting the existing bioreactors to construct pre-anoxic, anaerobic and anoxic zones.
- Installation of a methanol dosing system to provide additional readily biodegradable carbon for the denitrification process.
- Construction of a new primary sludge fermentation system to provide the volatile fatty acids necessary for maintaining a healthy biological phosphorus removal system.
- Construction of a UV disinfection facility to provide wastewater disinfection during the winter months to meet fecal and total coliforms limits.
- A preliminary study of a septage acceptance facility is being conducted as septage has been shown to contain constituents that could be detrimental to the new biological nutrient removal process.

### **Schedule**

It is estimated that the Preliminary, Conceptual, and Functional Design work will require approximately seven months, then the work will be segregated to allow for the tender and award of the major equipment. Equipment suppliers will be given a time frame of six months to manufacture and deliver the equipment. Detailed Design will take approximately six months and construction approximately eleven months. Detailed Design will be undertaken after award of contract for supply of major equipment items, as these items will dictate design parameters and significant differences exist between different manufacturer's equipment items. The following time frame was developed based on a construction completion date of December 2006.

<b>DESCRIPTION</b>	<b>TIME FRAME</b>
Preliminary Design	August 2004 to September 2004
Conceptual Design	September 2004 to October 2004
Functional Design	November 2004 to February 2005
Equipment Procurement	March 2005 to March 2006
Detailed Design	April 2005 to September 2005
Tender and Award	October 2005 to December 2005
Construction	January 2006 to December 2006
Commissioning	December 2006 to December 2007

### **Budget Summary**

Based on the conceptual design and the requirements of the Environment Act License issued by Manitoba Conservation, the project cost is estimated at \$26,520,000.

**WEWPCC Biological Nutrient Removal and Disinfection  
Capital Budget (in \$000) Requirements**

<b>Year</b>	<b>Authorized Capital</b>	<b>Actual + Projected Cashflows</b>	<b>Cumulative Capital Budget Remaining</b>
2000	\$ 520	\$ -	\$ 520
2004	9,500	570	9450
2005	16,500	9,852	16,098
2006	-	15,988	110
2007	-	110	0
<b>Total</b>	<b>\$ 26,520</b>	<b>\$ 26,520</b>	<b>\$ 0</b>

Additional financial information is provided in Appendix 1.

The approved funding includes:

- Funds in the amount of \$520,000.00 were included in the 2000 approved Supplementary Capital Estimates for Disinfection of Effluent at the WEWPCC
- Funds in the amount of \$6,102,000.00 are included in the 2004 approved Capital Budget for Nutrient Removal at the WEWPCC.
- Funds in the amount of \$3,398,000.00 are included in the 2004 approved Capital Budget for Wastewater Disinfection at the WEWPCC.

The submitted additional budget includes:

- Funds in the amount of \$16,200,000.00 are included in the 2005 Capital Budget five year forecast for Nutrient Removal at the WEWPCC. In the spring of 2004, the Engineering Consultant has indicated that budget for nutrient removal would be approximately \$22,300,000 not \$8,903,000 as estimated in the conceptual design study from 2001. This funding increase is required to implement full biological nutrient removal by the end of 2006 and meet the new effluent limits recently established by the Province of Manitoba. The funding for 2005 was increased from \$2,803,000 to \$16,200,000. In 2001, the effluent limits that were contemplated were as follows:
  - 1 mg/l Total Phosphorus limit based on the annual average
  - 8 mg/l Ammonia limit during the summer season (with the month of August being the critical month), with no specific limits for other seasons of the year
  - no Total Nitrogen limit

Commencing in early 2004, the conceptual design for the WEWPCC BNR upgrade was updated to take into account the most recent guidance from Manitoba Conservation on the likely nutrient effluent limits. The current estimate is based on the following effluent limits:

- 1 mg/l Total Phosphorus based on the annual average (no change)

- 10 mg/l total Nitrogen limit based on the annual average
- 4 mg/l Ammonia limit during the summer months
- 9 mg/l Ammonia limit during the winter months

The more stringent effluent limits for Ammonia and Total Nitrogen limit have dictated that additional process tankage be constructed to provide sufficient treatment capacity to achieve more complete ammonia and total nitrogen removal.

The updated estimate of \$22.3 million for nutrient removal also includes an allowance for possible escalation in material and construction prices potentially caused by higher than normal construction activity in Manitoba over the project construction period. This project is financed by the Environmental Reserve.

- Funds in the amount of \$300,000.00 are included in the 2005 Capital Budget five year forecast for a city wide Septage Acceptance and Treatment Study.

### **Risk Assessment/Mitigation:**

The WEWPCC Nutrient Removal and Disinfection Project will be a complex engineering assignment that will involve several phases and will span more than three years from start to finish. The following measures are being undertaken to ensure proper oversight of the project.

- To manage the project successfully over its life, a strong dedicated Project Management Team has been assembled with the necessary skills and experience, including a Project Director dedicated to this Project.
- An external panel of top North American experts will be utilized to provide peer review following the Conceptual and Functional Design phases of the Project.
- The City of Winnipeg Project Director will review the financial status of the Nutrient Removal and Disinfection Project with the Departmental Controller on a quarterly basis.
- A risk management process will be implemented that will identify potential risks and mitigative strategies.

Although a formal risk assessment/mitigation process will be conducted early in the detailed design stage, the following risk factors have been identified at this time.

### **Completion Date:**

On July 4, 2004, Manitoba Conservation issued a draft Environment Act License to the City of Winnipeg that required the construction and commissioning of the WEWPCC upgrade be completed by December 31, 2006. As part of the City of Winnipeg's comments submitted to Manitoba Conservation on August 9, 2004, the City asked for an extension of the commissioning period to December 31, 2007. The plant cannot be built and commissioned to fully comply with prescribed effluent limits on January 1, 2007. An extended commissioning period is appropriate and has been granted by Manitoba Conservation at other locations. If this requested change is not granted, the planned implementation of the project will not change as it is already undertaken as fast as possible.

## Wastewater Characteristics:

As a result of the wastewater characterization studies, further wastewater data is being collected. Depending on the results of ongoing studies and tests, as well as future discussion with Manitoba Conservation, there may be additional costs necessary to meet the license effluent limits. The following potential costs have been identified.

- A new septage management facility estimated at \$2.0 million. The WEWPCC currently accepts waste from septic haulers at a disposal facility at the Perimeter Pump Station. It has been shown that this waste stream can contribute up to 30% of the biological load to the plant at certain times of day and may contain constituents that could be detrimental to the treatment process or require expensive additions to the process. As part of this project, a study will be undertaken to better define this problem and to determine if a new or modified septage facility is necessary.
- Impact of non-readily biodegradable nitrogen in the wastewater estimated at \$10.0-\$15.0 million. A recent draft report of a Nitrifier Growth Rate Study at the WEWPCC noted that the fraction of soluble non-readily biodegradable nitrogen in the raw sewage during the study period was approximately 5 times higher than expected values. This represents 5.6 milligrams per litre of the 10 milligrams per litre license limit for the months of June through October, of which the city has no means to control. This is new information that is currently being dealt with in the following manner:
  - o The City of Winnipeg is in the process of reviewing the data for any calculation or data collection anomalies.
  - o Further wastewater testing will be performed over the next several months to verify the report results.
  - o Manitoba Conservation will be approached to consider modifying the license limit for nitrogen to recognize this constituent of the wastewater.

If the City determines that the data is indicative of the normal wastewater characteristics of the West End and is still required to comply with the current total nitrogen limits, then additional treatment of the wastewater is necessary to further reduce the biodegradable portion of the total nitrogen.

## Market Forces:

In addition to the above, there is a possibility of cost escalation due to market forces. There are numerous large projects currently in the design and construction phase in Manitoba as well as an expected decline in the availability of steel due to overseas construction.

## **FINANCIAL IMPACT:**

The following financial impact statement for this project has been prepared in accordance with the recommendation adopted by Council on December 13, 2000.

## **Financial Impact Statement**

**Date:** September 24, 2004

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**Project Name:** **First Year of Program** **2004**

WEST END WATER POLLUTION CONTROL CENTRE (WEWPCC) PROCESS UPGRADING:  
BIOLOGICAL NUTRIENT REMOVAL AND DISINFECTION SYSTEM ENHANCEMENTS

### **COMMENTS**

As this report is submitted for information only, there is no financial impact related to the recommendation.

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Mira L. Geer C.A.  
Manager of Finance & Administration

**IN PREPARING THIS REPORT THERE WAS CONSULTATION WITH AND  
CONCURRENCE BY: N/A**

### **THIS REPORT SUBMITTED BY:**

Water and Waste Department  
Engineering Division  
Prepared by: J. Veilleux, P.Eng.  
File No. S-596

JV:lc:km

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## **APPENDIX 1**

**WEWPCC - DISINFECTION AND NUTRIENT REMOVAL  
WATER AND WASTE DEPARTMENT - ENGINEERING DIVISION  
APPENDIX 1  
As at September 21, 2004**

Components	COSTS				PROJECTED COSTS TO COMPLETE					TOTAL	VARIANCE	NOTE
	Total Budgeted Costs	Approved Budget To Date	Costs Incurred up to last report	Costs submitted this report	Total Costs Incurred to Date (per G/L) 21-Sep-04	2004	2005	2006	2007	Total Costs Remaining to Complete	Total Project Cost	Variance from Budget ( Unfavourable )
<b>ENGINEERING</b>												
A) PRELIMINARY DESIGN/CONCEPTUAL	397,000	397,000	-	-	-	397,000	-			397,000	397,000	0
B) FUNCTIONAL/DETAILED DESIGN	1,518,000	1,518,000	-	-	-	172,500	1,345,500			1,518,000	1,518,000	0
C) CONTRACT ADMIN/COMMISSIONING	1,117,000	1,117,000	-	-	-	-	387,000	620,000	110,000	1,117,000	1,117,000	0
<b>Total Engineering</b>	<b>3,032,000</b>	<b>3,032,000</b>	-	-	-	<b>569,500</b>	<b>1,732,500</b>	<b>620,000</b>	<b>110,000</b>	<b>3,032,000</b>	<b>3,032,000</b>	0
<b>FACILITIES CONSTRUCTION</b>												
A) UV DISINFECTION FACILITIES	3,300,000	3,300,000	-	-	-	-	1,320,000	1,980,000		3,300,000	3,300,000	0
B) NUTRIENT REMOVAL FACILITIES	20,188,000	3,688,000	-	-	-	-	6,800,000	13,388,000		20,188,000	20,188,000	0
<b>Total Facilities Construction</b>	<b>23,488,000</b>	<b>6,988,000</b>	-	-	-	-	<b>8,120,000</b>	<b>15,368,000</b>	-	<b>23,488,000</b>	<b>23,488,000</b>	-
<b>Total</b>	<b>26,520,000</b>	<b>10,020,000</b>	-	-	-	<b>569,500</b>	<b>9,852,500</b>	<b>15,988,000</b>	<b>110,000</b>	<b>26,520,000</b>	-	<b>26,520,000</b>
Percentage Complete						0%						